ESC201AT : Introduction to Electronics

Lecture-1 : Introduction

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Modern world has been and is being rapidly transformed by ELECTRONICS

Objective : Learn how electronics enables use of electricity to solve problems

Learn Engineering Problem Solving

Why has Electronics Revolutionized our lives?

❑ Every action requires energy

❑ Electricity is one of the most useful forms of energy

(it is easy to generate, easy to transport and can be easily converted into other forms of energy)
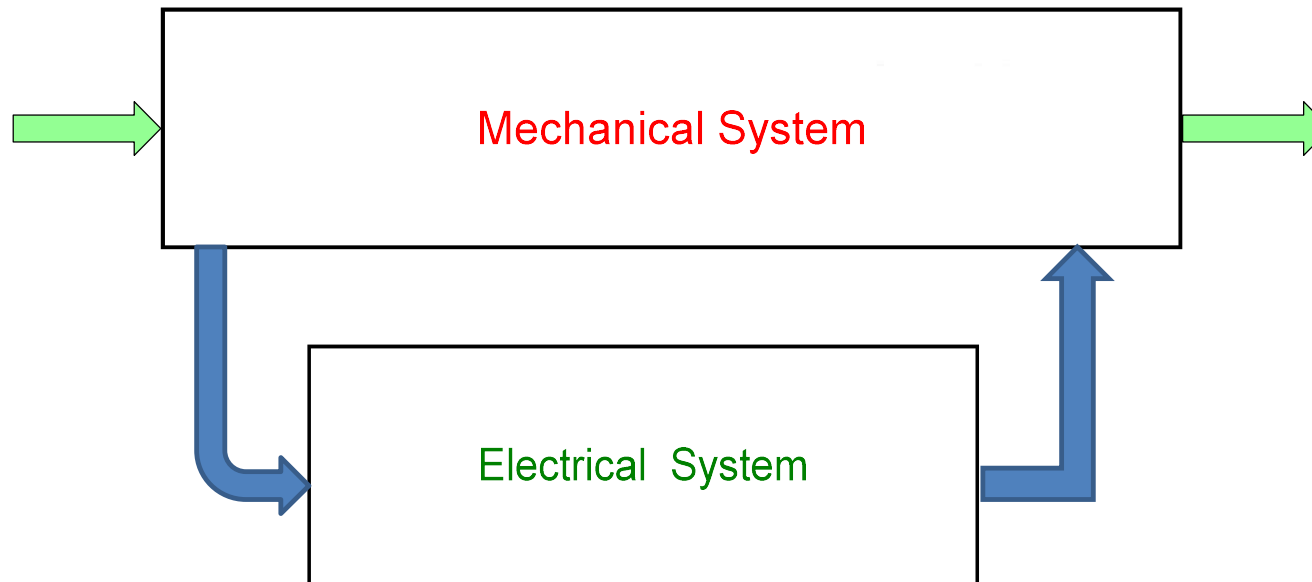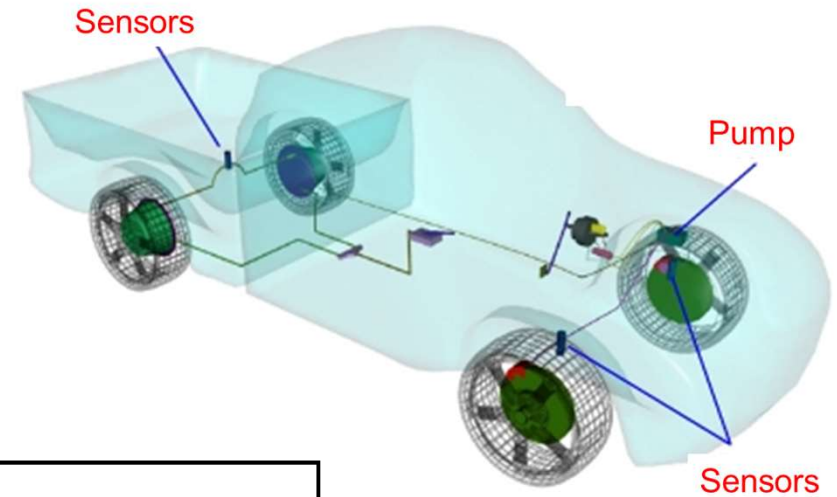
❑ It can be precisely **Controlled**

Suppose you have a form of energy which is "easily available" and you can make it do 'whatever' you wish !!
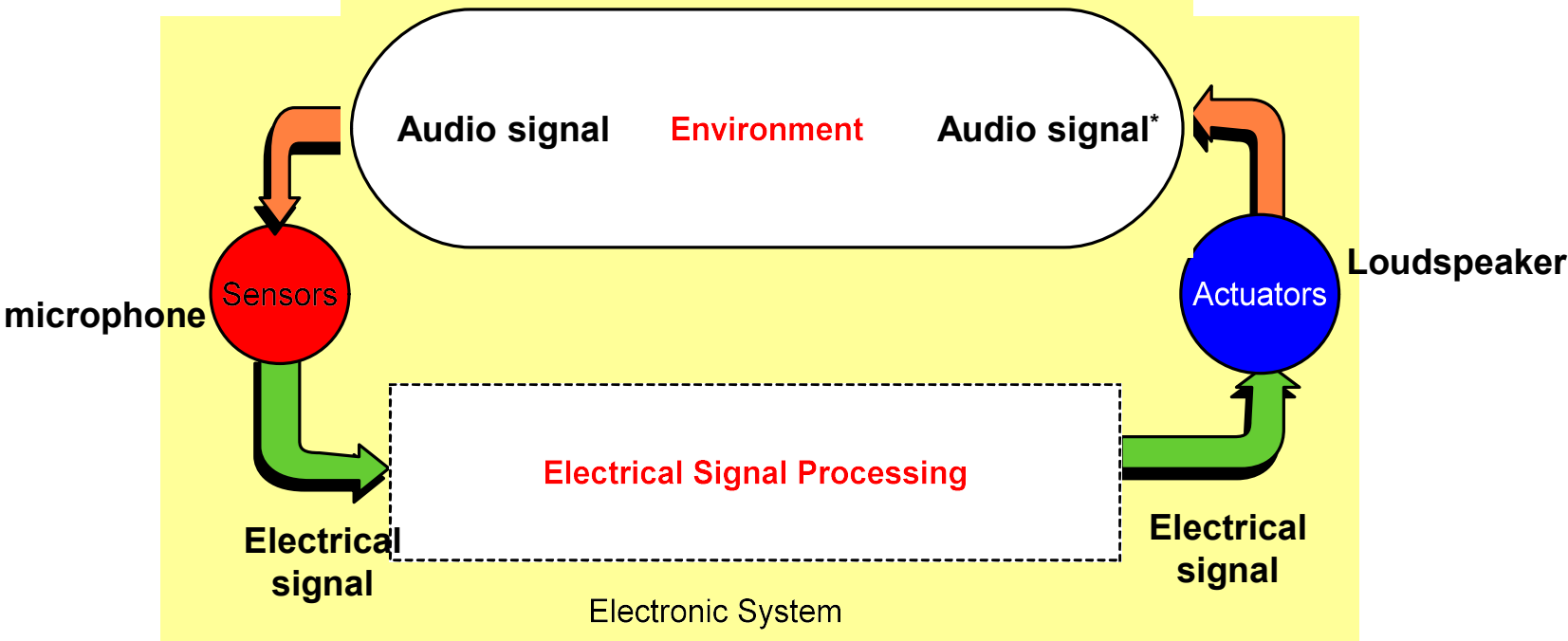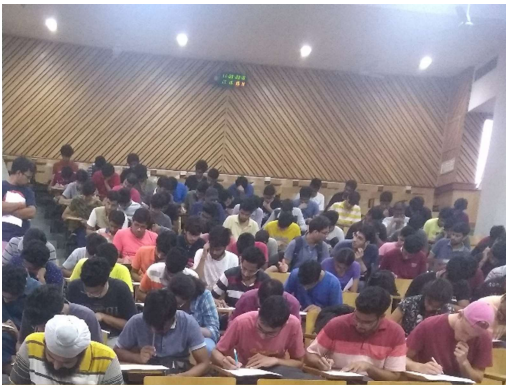
Only limit is your imagination

Little wonder then that control of Electricity ushered in the Electronics Revolution
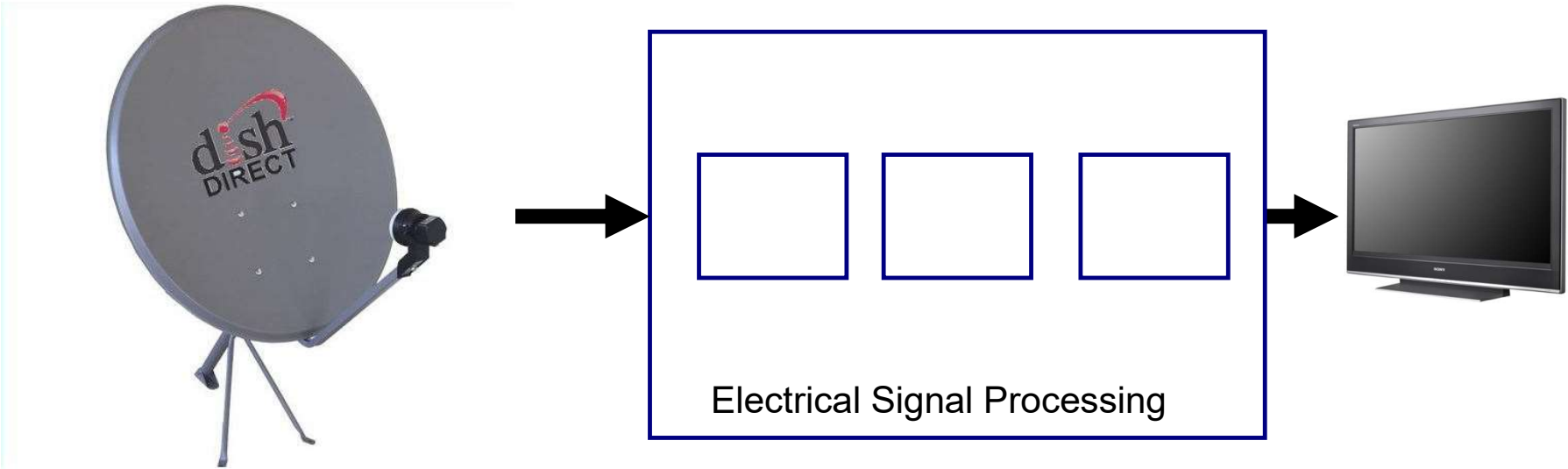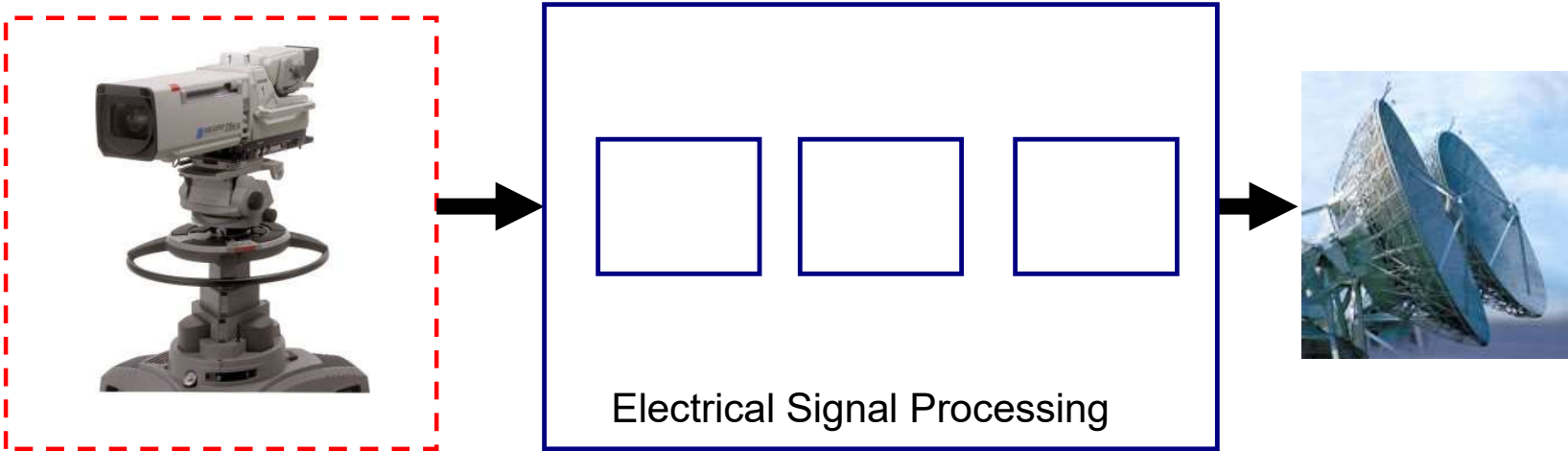
Control system

Sensors

Pump

Sensors

Mechanical System

Electrical System

Communication

Audio signal **Environment** **Audio signal***

Sensors

microphone

Actuators

Loudspeaker

Electrical signal

Electrical Signal Processing

Electrical signal

Electronic System

Communication

Communication

Electrical Signal Processing

Electrical Signal Processing

Communication

Environment

Sensors

Actuators

Electrical Signal Processing

Electrical signal

Electrical signal
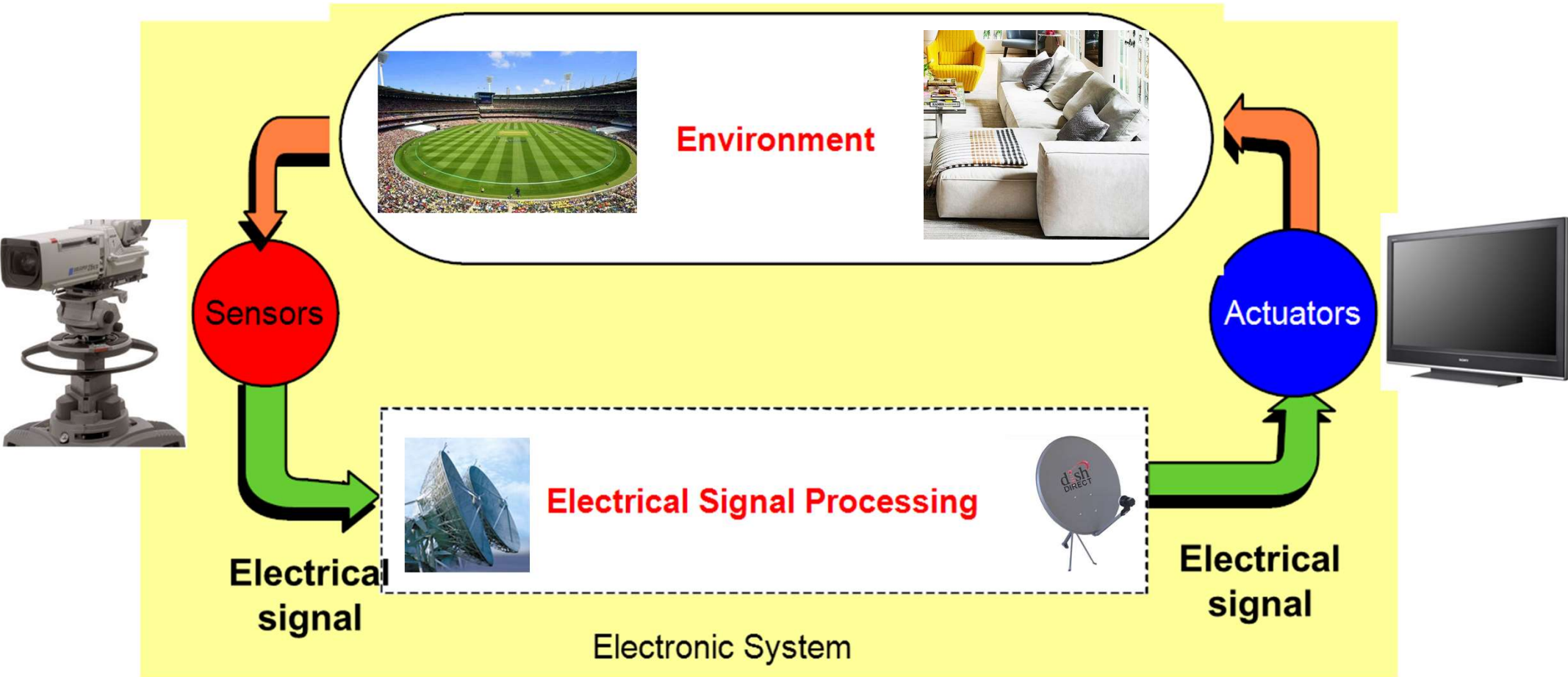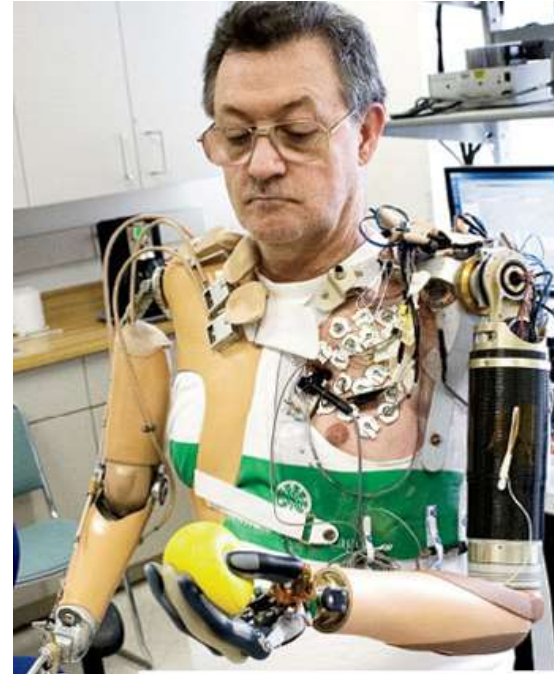
Electronic System

Electrocardiogram (ECG)
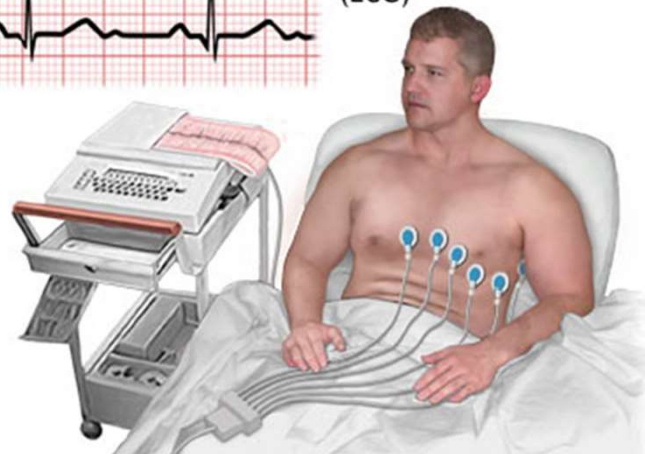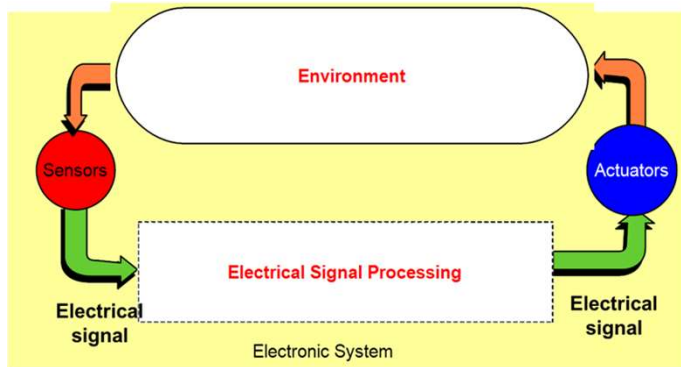
Solve Problem by transforming them to an electronics problem
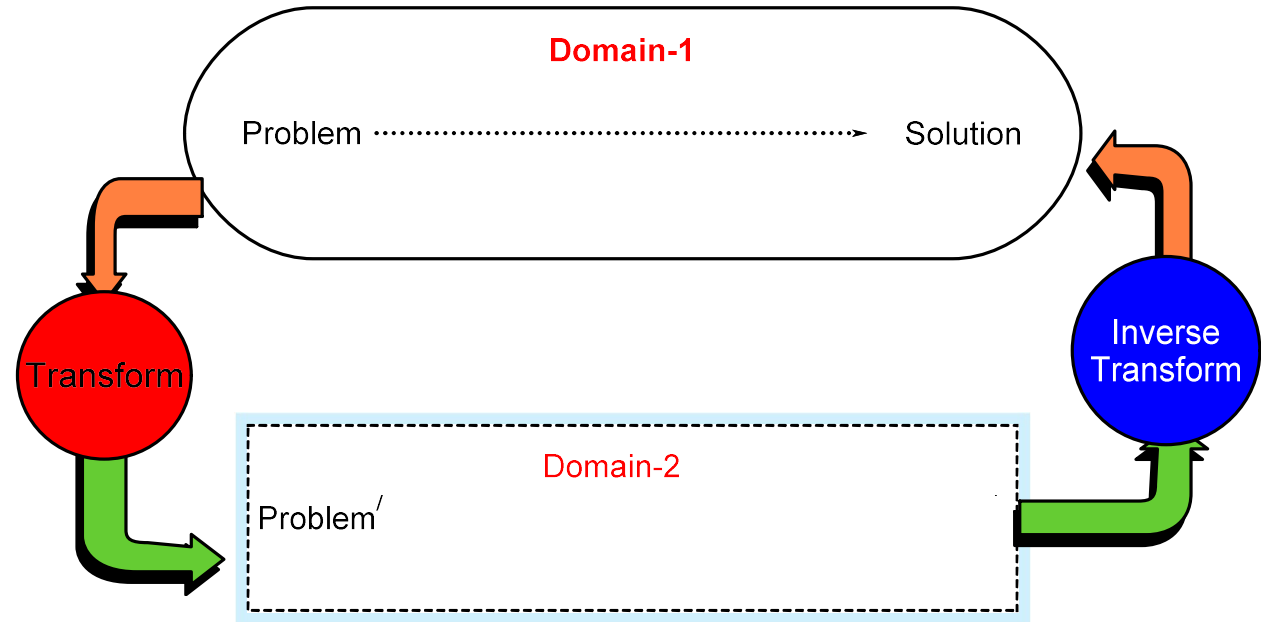
A General Problem-Solving approach

A General Problem-Solving approach

Audio signal

Electronic System

Sensors → Analog SP → A/D → Digital SP → D/A → Analog SP → Actuators

Environment
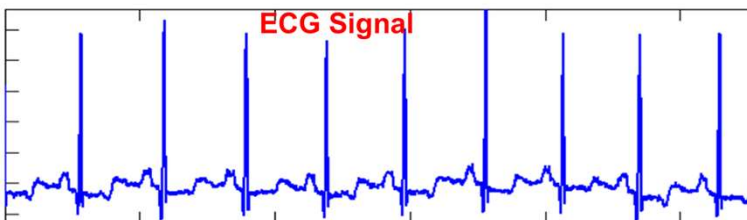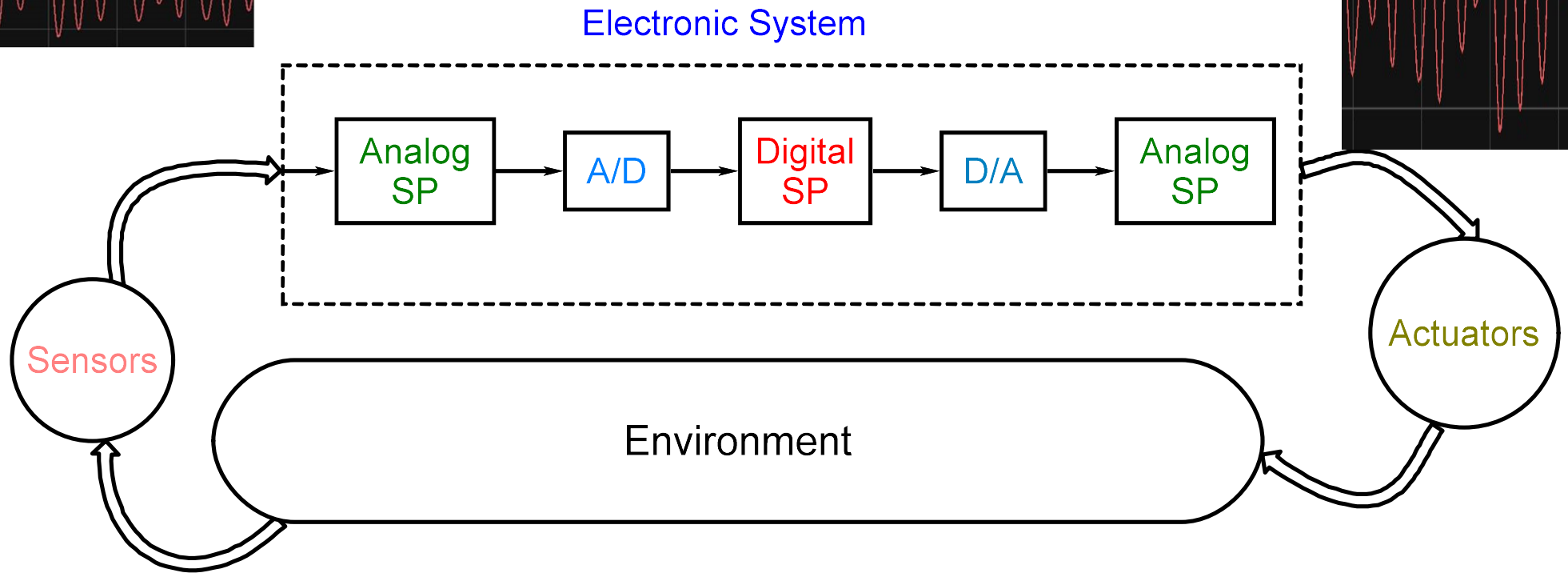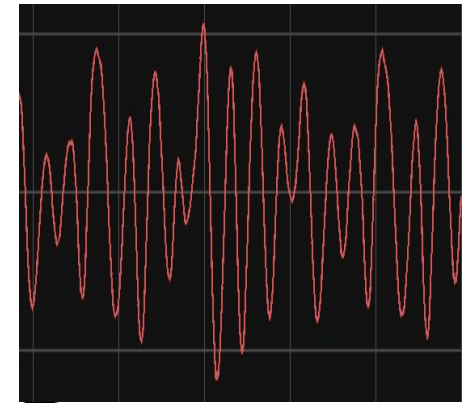
ECG Signal

1. Analog Signal Processing
2. Data Converter
3. Digital Signal Processing
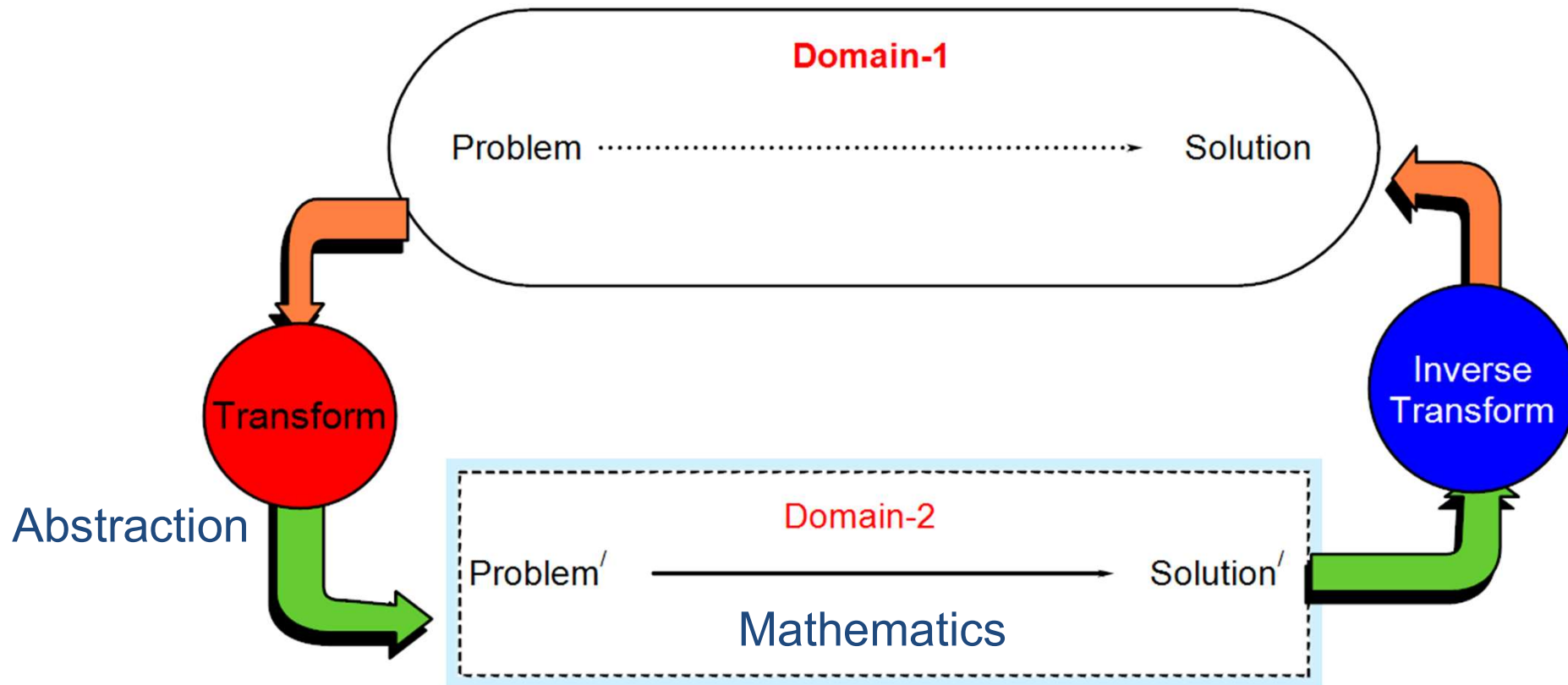
Custom Software

Programmable hardware

Analog SP → A/D → Digital SP → D/A → Analog SP

General Purpose Programmable hardware

sensor

Actuator

Environment
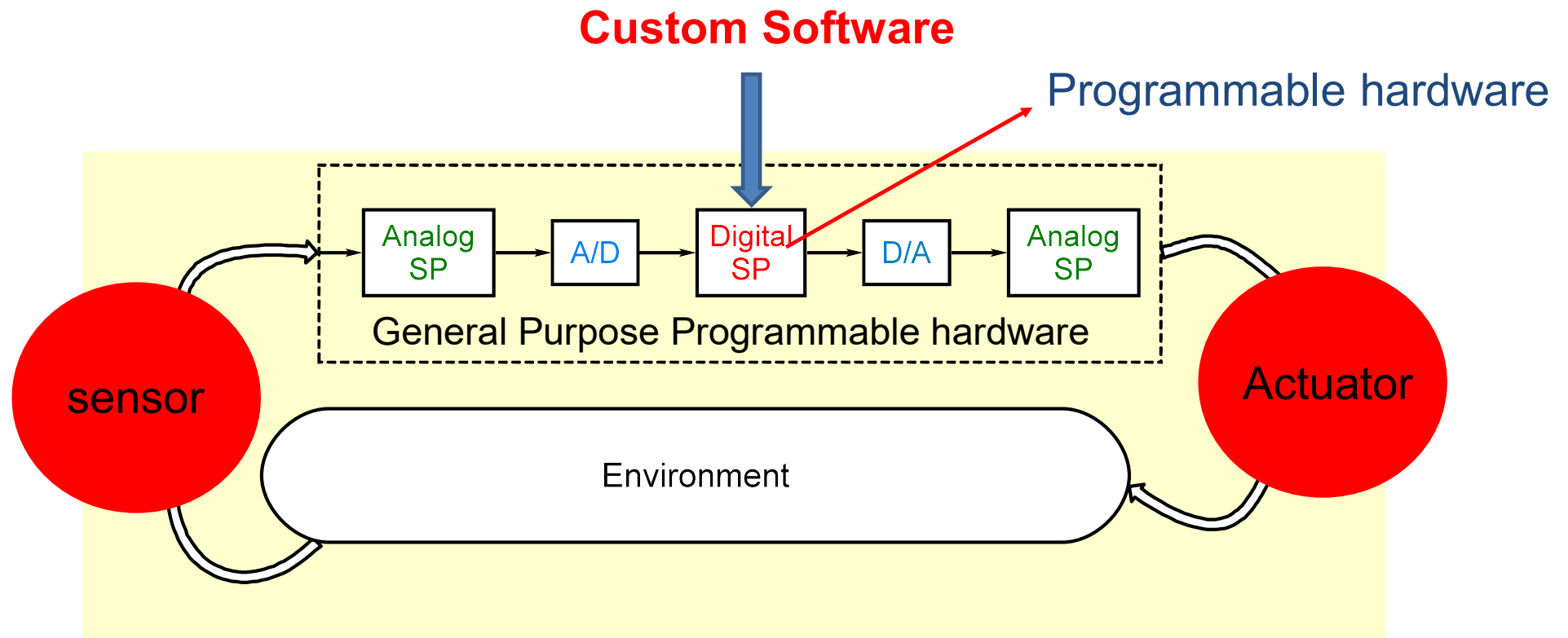
Software as a Solution

Course Objective : Learn how electronics enables use of electricity to solve problems
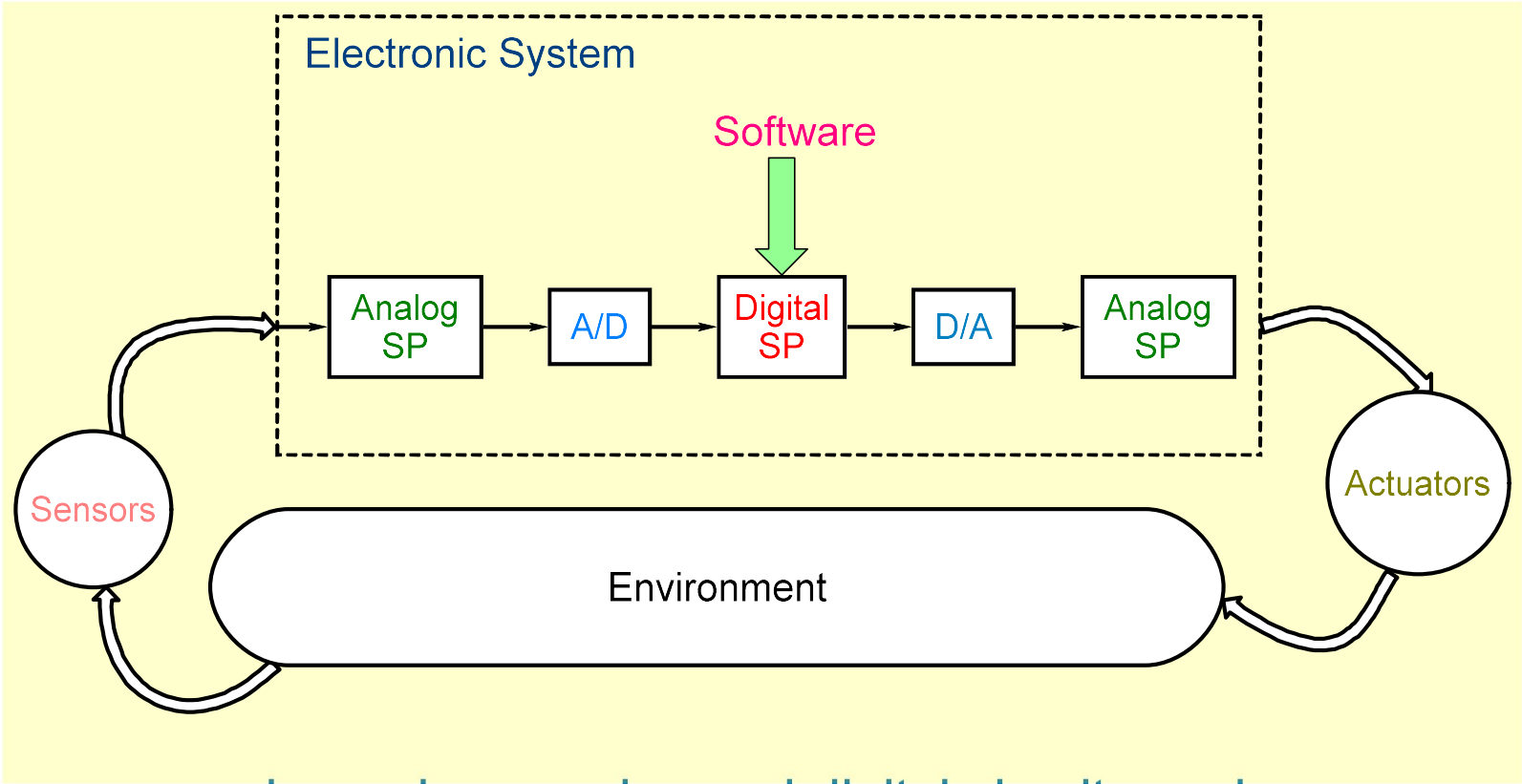
Learn how analog and digital circuits work

In ESC201A we learn by analyzing and designing analog and digital circuits

Course Objective : Learn how electronics enables use of electricity to solve problems

Learn how analog and digital circuits work

Learn by analyzing and designing analog and digital circuits

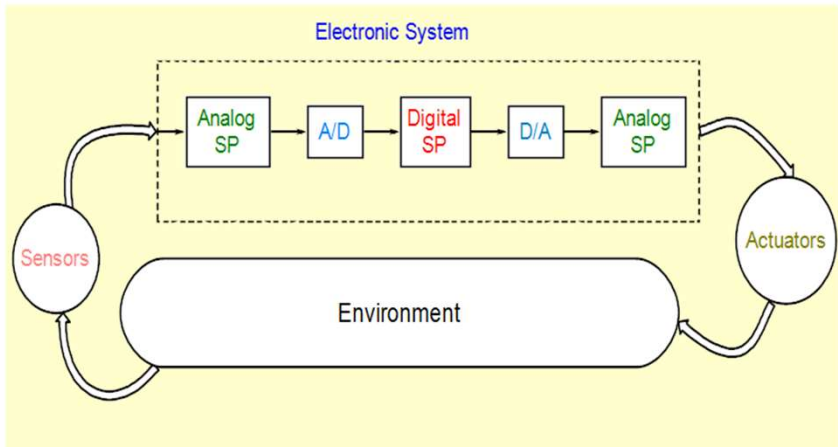**Tools for circuit Analysis**
- ❑ Fundamentals of electrical circuits--3
- ❑ Transient Analysis of RLC Circuits--2
- ❑ Sinusoidal Steady State Analysis--4

Analog Circuits
- ❑ Semiconductors, Diodes, Circuits-----3
- ❑ Transistors and Amplifiers---4
- ❑ Operational Amplifier based Analog circuits -4

Digital Circuits
- ❑ Logic gates, Combinational circuits ---4
- ❑ Flip-flops, Sequential Circuit---4
- ❑ Data Converters----3

Books

1. Engineering Circuit Analysis by W. Hayt, J. E. Kemmerly and S. M. Durbin, TATA McGraw Hill.
2. Circuits, Devices and Systems by Ralph Smith, John Wiley

3. Electronic Devices and Circuit Theory by R. Boylestad and L. Nashelsky, Prentice Hall of India.
4. Microelectronic Circuits by A. S. Sedra and K. C. Smith, Oxford Univ. Press.
5. OP Amps and Linear Integrated Circuits by Ramakant A. Gayakward, Pearson Education.
6. Microelectronics by J. Millman and A. Grabel, McGraw Hill.

7. Digital Principles and Applications by A. P. Malvino and D. P. Leach, TATA McGraw Hill.
8. Digital Principal by Morris Mano, Prentice Hall of India.

Tentative Evaluation (subject to change)

Midterm Exams	30%
Final Exams	40%
Tutorials	10%
Quizzes	20%

Instructor

B. Mazhari, Professor, Dept. of Electrical Engineering,

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email: baquer@iitk.ac.in
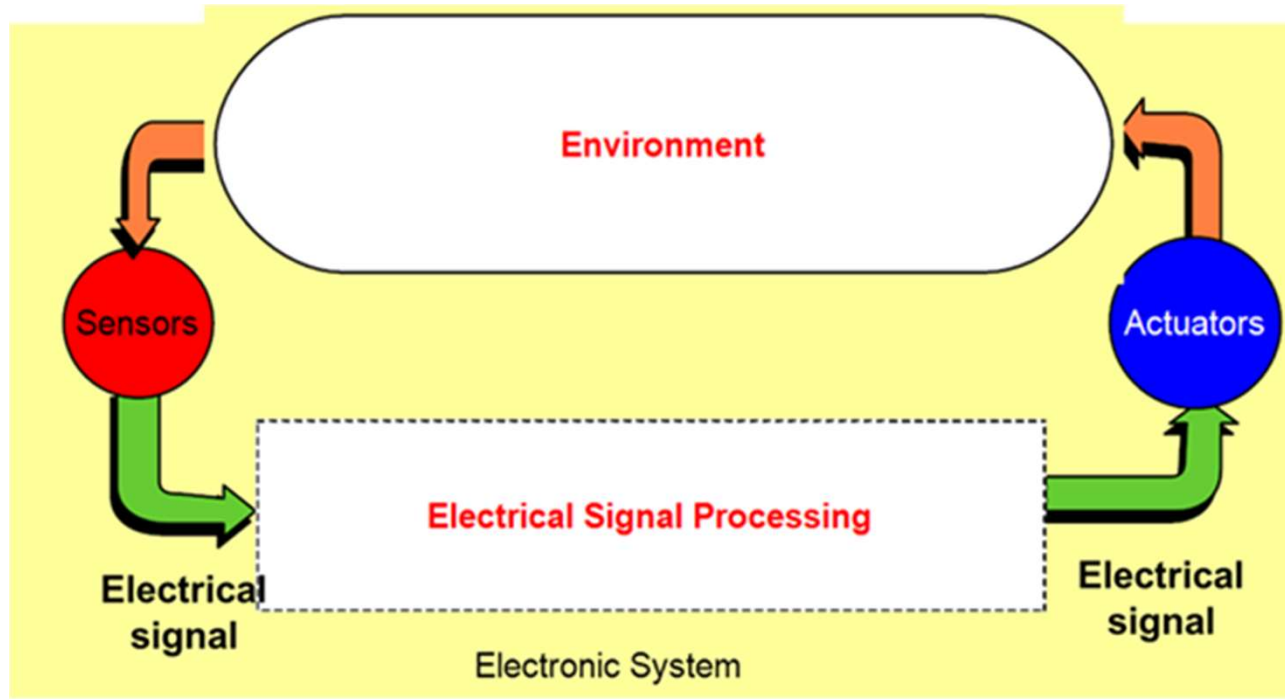
Discussion Hour: Wednesday: 6-7 PM

Course Details

Lecture notes, assignments, solutions etc would be available on MooKIT Platform

Discussion: Wednesday 6-7 pm ; Tutorials: Friday : 6-7pm

- Discussion hour would be used to clarify doubts related to posted lectures

- Homework Assignment sheets would be given every week.

- For proper learning it is expected that students would attempt to solve all the problems prior to tutorial.

- Students are <u>not required</u> to submit HW solutions.

- During the tutorial, students would be asked to solve a problem related to the HW assignment. These would be graded and used in tutorial assessment.

- Solutions to HW assignments would be discussed during tutorials and also posted online

More details regarding conduct of tutorials and discussions will be posted on mooKIT

Solve Problem by transforming them to an electronics problem